

CLAIMS:

1. An extract comprising high molecular weight *Chlorella* polysaccharide and polysaccharide complexes, wherein the high molecular weight polysaccharide and polysaccharide complexes
5 are about 1×10^5 Da to about 1×10^7 Da and constitute at least 22% (w/w) of the total *Chlorella*-derived content of the extract.
2. The extract of claim 1 wherein the high molecular weight polysaccharide and polysaccharide complexes are about
10 5×10^5 Da to about 5×10^6 Da.
3. The extract of claim 1 wherein the high molecular weight polysaccharide and polysaccharide complexes constitute at least 26% (w/w) of the total *Chlorella*-derived content of the extract.
- 15 4. The extract of claim 1 wherein the high molecular weight polysaccharide and polysaccharide complexes constitute at least 30% (w/w) of the total *Chlorella*-derived content of the extract.
5. The extract of claim 1 wherein the high molecular
20 weight polysaccharide and polysaccharide complexes contain glucose and at least one monosaccharide selected from the group consisting of: galactose, rhamnose, mannose and arabinose.
6. The extract of claim 5 wherein the high molecular weight polysaccharide and polysaccharide complexes are
25 substantially free of ribose.
7. The extract of claim 1 which is substantially free of nucleic acids and ribonucleic acids.

8. The extract of claim 5 wherein the high molecular weight polysaccharide and polysaccharide complexes also contain N-acetyl glucosamine and N-acetyl galactosamine.

9. The extract of claim 1 which is substantially free of unassociated proteins.

10. An extract consisting of high molecular weight *Chlorella* polysaccharide and polysaccharide complexes, wherein the high molecular weight polysaccharide and polysaccharide complexes are about 1×10^5 Da to about 1×10^7 Da.

10 11. The extract of claim 10 wherein the high molecular weight polysaccharide and polysaccharide complexes are about 1×10^6 Da to about 5×10^6 Da.

12. The extract of claim 1 which retains immunomodulating activity upon treatment under conditions and for a length of time sufficient to effect digestion of unassociated DNA.

13. The extract of claim 1 which retains immunomodulating activity upon treatment under conditions and for a length of time sufficient to effect digestion of unassociated RNA.

14. The extract of claim 1 which retains immunomodulating activity upon treatment under conditions and for a length of time sufficient to effect digestion of unassociated proteins.

15. The extract of claim 1 which retains immunomodulating activity upon treatment under conditions and for a length of time sufficient to effect cleavage of glycosidic linkages with at least one glycosidase selected from the group consisting of: amylase, amyloglucosidase, cellulase and neuraminidase.

16. The extract of claim 1 which retains immunomodulating activity upon treatment under conditions and for a length of time sufficient to effect cleavage of:

- (i) three or more α -1,4-linked D-glucose units;
- (ii) α -1,4-linked glucosides;
- (iii) α -1,4-linked galactosides; or
- (iv) α -1,4-linked D-glucose.

5 17. The extract of claim 14 wherein the treatment is digestion with protease.

18. The extract of claim 1 wherein the high molecular weight *Chlorella* polysaccharide and polysaccharide complexes are from *Chlorella pyrenoidosa*.

10 19. A pharmaceutical composition comprising the extract of claim 1, in admixture with a pharmaceutically acceptable diluent or carrier.

20. A nutritional composition comprising the extract of claim 1, and at least one energy source selected from the group
15 consisting of carbohydrate, fat and nitrogen sources.

21. A nutritional supplement comprising the extract of claim 1 and a conventional supplement selected from the group consisting of: vitamin E, vitamin C and folic acid.

22. A nutritional supplement comprising the extract of
20 claim 1 and a nutraceutical selected from the group consisting of: fish oils, spirulina and echinacea.

23. A commercial package containing as an active ingredient the extract of claim 1, together with instructions for its use as an immunomodulator.

25 24. A process for obtaining a *Chlorella* extract having immunomodulating activity, comprising:

(a) size fractionating an aqueous extract of *Chlorella*, and

(b) selecting fractions comprising high molecular weight polysaccharide and polysaccharide complexes of about 1×10^5 Da to about 1×10^7 Da.

25. The process of claim 24 further comprising the step of pooling and concentrating the selected fractions.

26. The process of claim 24 wherein the size fractionating step comprises chromatography or ultrafiltration.

10 27. An extract obtained from the process of claim 24.

28. A method for modulating the immune response of a mammal, the method comprising administering to the mammal an effective amount of the extract of claim 1.

15 29. The method of claim 28 wherein modulation comprises increased proliferation of splenocytes.

30. The method of claim 28 wherein modulation comprises increased production of cytokines.

31. The method of claim 30 wherein the cytokine is selected from the group consisting of IL-6, IL-10, INF- γ and
20 TNF- α .

32. A method for supplementing the immune response to a vaccine in a mammal, the method comprising administering an effective amount of the extract of claim 1 to the mammal being vaccinated.

25 33. The method of claim 32 wherein the vaccine is a flu vaccine.

34. A method for preventing or treating bacterial infection in a mammal, the method comprising administering to the mammal an effective amount of the extract of claim 1.

35. A method for preventing or treating fungal infection
5 in a mammal, the method comprising administering to the mammal an effective amount of the extract of claim 1.